

SPACE SCIENCE ADVISORY COMMITTEE (SScAC) MEETING

NASA Headquarters
August 5-7, 2002

*Letter to Associate Administrator Dr. Edward Weiler from Dr. Andrew Christensen,
Chair of SScAC*

Dear Dr. Weiler,

The Space Science Advisory Committee (SScAC) met in public session August 5-7, 2002 at NASA Headquarters. We had a very good attendance by the committee, all members save one were there to consider the very full agenda placed before the committee. My thanks to Marc Allen and his staff for all their efforts in laying a foundation for a successful meeting. True, we had a heavy agenda, but it was well organized and also I believe your willingness to spend extra discussion time with us allowed us to feel comfortable with our understanding of the issues before us.

Your staff continued in the tradition of outstanding presentations. Richard Fisher, Anne Kinney, Colleen Hartman, Orlando Figueroa and Harley Thronson were to the point, informative and concise which allowed us to maintain the rather tight schedule. The meeting began with the briefings from the Division Directors who set the stage for the discussion on science issues that continued through the meeting. Much of our time was devoted to review of the on-going activities of the sub-committees in GPRA and Roadmap areas. We also devoted a morning to briefings by the Space Sciences Board on their decadal studies. We were delighted to hear from Joe Alexander, James Burch, Joe Burns and Jonathan Lunine who presented the results of their panel deliberations. All items were of importance, and to make room for them it was necessary to delete from the agenda some items of interest to the committee. We will take up on these items at a future meeting, but they are highlighted herein for reference. Specific comments and recommendations are summarized below.

Operational Space Weather Observations at L1

The measurement of the space weather in the solar wind stream in front of the Earth's bow shock is important to the operational space weather communities in NOAA and DoD and in the scientific community. No research satellites are proposed; however, the Space Science Advisory Committee notes that many new initiatives identified in the Space Science Board Decadal Surveys and the NASA Roadmap activities presume continued monitoring of the interplanetary environment at or near the Lagrangian point L1.

The important question is which of the government agencies involved should provide the capability and which should assume responsibility for its maintenance. **The committee strongly urges NASA to engage all organizations that utilize measured solar wind variables, either for basic science or for space weather applications. The goal of these discussions should be to identify the responsible agency and the methodology by which monitoring of the interplanetary environment at L1 will be accomplished and maintained.**

Launch Capabilities for Smaller Spacecraft

The SScAC continues to be concerned about the status and future of launch capabilities for smaller spacecraft and payloads. We were unable to have a briefing on this topic as requested in our last letter, but appreciated receiving the short informal summary from Marc Allen. This short document highlights the basis for our concerns: 1) the Delta II is expected to be phased out later this decade and new launchers under development are expected to be bigger and more expensive; 2) The Athena vehicle is no longer available and while Pegasus has generally provided good service to Space Science, the larger Taurus has not yet launched such a mission; and 3) even for the limited set of orbits reachable as secondary payloads (e.g., GTO), few if any such opportunities are actually available in the U.S. There are several additional foreign launch options and the Ariane-5 provides routine opportunities for secondary payloads, however, the national launch policy precludes NASA paying for such launchers.

The paucity of reasonable launch options endangers Space Science's ability to carry through on its strategic plan and to carry out some of its most exciting smaller science-driven missions, such as the Explorers. The notion that this problem can be fixed by simply co-manifesting multiple payloads on a single large launcher will not work in general both because many of the missions need to reach unique orbits and because tying together schedules from multiple missions will cause delays and drive costs.

This is a very serious problem for OSS and probably also for ESS and the SScAC desires to engage in trying to help find workable solutions for it. **We request that OSS provide background information and support to SScAC as we develop our position prior to requesting the help and support of the NAC.**

Nuclear Power and Propulsion

Many space science missions are limited by power and propulsion constraints. Solar power falls off with the square of the distance from the Sun. Battery power is limited. The fundamental laws of physics require nuclear power and propulsion for any mission requiring high power and any mission requiring complex mission operations at the surface, in orbit, or involving multiple targets. Further, any mission beyond the orbit of Mars is enabled with nuclear power, and any mission beyond the orbit of Jupiter requires nuclear power.

The SScAC is concerned that budgetary pressures may lead to delay and budget reductions in the Nuclear Systems Initiative. We hope this can be avoided as much

as possible. The program is important to the future of our science and we want to reiterate our strong endorsement of the Nuclear Systems Initiative proposed in the FY 03 budget.

Flagship Missions

Progress in the exploration of the solar system inevitably leads to discoveries that pose new questions, often leading to missions of increasing sophistication and complexity. Complex missions such as a Solar Probe and planetary orbiters, landers, and sample return missions address sophisticated questions, which tend to be more expensive than remote sensing and planetary flyby missions.

In general, the basic cost-capped mission lines do an excellent job of maintaining a reasonable launch rate while accomplishing many of our critical science objectives. However, certain scientific questions demand missions of a complexity, difficulty, and new technology that make them a flagship mission. They then rise above the level of present cost caps. For example, the high priority Solar Probe mission is expected to cost >\$0.5 B, far in excess of either the Solar Terrestrial Probe or LWS mission line caps. On the planetary side, the Europa Geophysical Orbiter and Mars Sample Return missions will exceed \$1B, far more than the New Frontiers Mission line cap. It must be remembered that the cost cap missions (e.g. Discovery and Explorer) are very low risk. It is through the development of Flagship missions that new technology is implemented that subsequently becomes appropriate for use in cost capped missions. It is therefore necessary to ensure there is a mechanism for carrying out flagship missions within all the OSS themes. It is not acceptable to simply gut the rest of these programs' lines to do a single flagship mission. **Rather, the SScAC advises that some other solution be found to accommodate occasional Flagship missions.** Could a mechanism be found, for example, to augment the budget of a cost capped mission to accomplish a once-per-decade top priority science objectives represented by these rare flagship missions?

Technology

The SScAC appreciates the efforts of the Office of Space Science to identify the pacing technology initiatives for the space science missions of tomorrow, and continues to support the establishment of a comprehensive technology development program across all space science themes. The technology blueprint and technology assessment activities of the Solar System Exploration theme are to be applauded, as is the new initiative for nuclear space power and propulsion.

However, the Committee is concerned that Code S does not have its own well-defined technology program and budget. We understand following the excellent presentation by David Andrucyk that individual programs and projects are required to bear the financial and programmatic responsibilities for technology development past TRL 3, based on

activities initiated by the Office of Aerospace Technology. Experience indicates that flight programs traditionally avoid the adoption of technologies below TRL 6 or 7, viewing technology development activities as a threat to budget, schedule, and mission assurance for flight programs. The practical effect of this policy is that numerous promising technologies languish in the “no man’s land” beyond TRL 3 for years or decades.

SScAC believes that technology development is a critical element of a successful space science program, and that Code S requirements are not being met by current policies. We note that the recently completed Technology Blueprint reports significant cases of lack of funding for development of high priority technologies and deficiencies in the definition of requirements in many others. We encourage Code S to continue its efforts to formulate a technology development strategy with adequate funding that bridges the gap in technology readiness levels and takes advantage of technology development activities within academia and other federal agencies.

The SScAC requests an integrated response from Code S and Code R to the technology roadmaps that are now being prepared. At the SScAC meeting in March, the technology requirements flowing from the Strategic plans should be reviewed in light of the Code R and Code S funding plans.

Mars Exploration Program

The SScAC heard a report on the status of the Mars Exploration Program as part of the presentation of Solar System Exploration Director Colleen Hartman, and also from the Director of the Mars Exploration Program Office, Orlando Figueroa.

We realize the importance of this mission to not only the Mars Exploration Program but to all of OSS. Hence we take great interest in its progress. At the March 2002 meeting, the SScAC expressed grave concern that the MER mission was dangerously close to a path of significant risk. The addition of \$100M additional resources apparently has had a very noticeable impact. Nevertheless, we share your concern that the MER mission still faces formidable challenges in schedule and cost. We believe you have a strong management team in place to address these issues and SScAC remains supportive of those who may need to make hard decision.

GPRA

With the OSS Strategic Planning meeting scheduled for November, our preparation of the GPRA reports came early this year. The SScAC reviewed the contributions from each of the four OSS themes and was very impressed with this year’s scientific accomplishments.

Based on the 2002 GPRA reports, we discussed at length how to properly recognize the lack of progress toward a scientific question because of a delay in the launch of a key mission. The SScAC suggests that it might be a good idea to recognize explicitly, where

appropriate, delays in the start of operations of major missions. It seems clear that, for a mission *for which there is no comparable source of scientific capability*, the loss of the mission rates a “red” in the GPRA report. It also seems appropriate to assign a “yellow” for the delay of a mission by a year or more. However, we believe a delay in a particular mission may be mitigated by citing progress in the same science area made possible by other missions. For example, this year the OS reported a “green” for the study of galaxy evolution even though SIRTf, whose data will be decisive for some questions, has experienced a year’s delay. Offsetting this disappointment were important studies with HST that found a remarkably high stellar birth rate in very young galaxies. Furthermore the SM3B installation on HST of the Advanced Camera for Surveys, and the revival of NICMOS with the installation of a cryo-cooler provided a substantial increase in capabilities for galaxy evolution studies. Taken all together, the “green” rating is appropriate, but an explicit reference to the SIRTf delay is important for the credibility of the process.

Also, the SScAC suggests that, with beginning of the 2003 GPRA process, the theme scientists invite subcommittee members to submit suggestions of the year’s most important scientific results in their discipline. This will broaden the perspective and should be helpful to HQ personnel in preparing the first draft of GPRA items. We also believe that the review process at SScAC would be facilitated with preview copies of the subcommittee inputs.

E/PO

The SScAC received a progress report from the E/PO Task Force, given by Paul Knappenberger. The Committee was pleased with the state of E/PO programs in the OSS, which is both broadly-based and engaging. We believe their efforts to independently assess the impact of their programs are commendable. We encourage the Task Force to consider ways to enhance opportunities for young scientists interested in E/PO to develop experience in that area, perhaps through a NASA-sponsored E/PO fellowship program. We understand that plans are underway to reorganize E/PO programs at NASA, and encourage the Agency to preserve and build upon the successful model provided by the OSS.

Sincerely

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